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Chapter 1 Introduction

1.1 Introduction to the Manual

You can get a brief idea of the contents of this manual by reading the following:

- Feature Description: Introduces the main features of each module presented in this manual.
- Logging onto MSR Series Routers: Helps you know about the user interfaces supported on the MSR series routers and how to log on or telnet through the Console port or the Ethernet interface.
- Registering the Software: Introduces the registration methods of the MSR series routers.
- Software Maintenance: Introduces software upgrade and maintenance method of the router and how to deal with password loss, helping you familiar with software upgrade and configuration file maintenance in all modes.
- Slot Position of H3C MSR Series Routers: Helps you finding the slot position with a diagram when you are maintaining the router.

1.2 Related Manuals

- For the installation, startup and configuration, software maintenance, hardware maintenance and troubleshooting of the router, refer to H3C MSR 20/30/50 Series Routers *Installation Manual.*
- For the functions, interface attributes, panel, LED of an interface card and interface module and interface cable connection, refer to H3C MSR 20/30/50 Series Routers *Interface Card and Interface Module Manual*.
- For all cable pinouts available with LMR series routers, refer to LMR Series Routers Cable Manual.
- For configuration examples of H3C MSR 20/30/50 Series Routers, visit website of H3C.
- You can log onto http://www.h3c.com to get product manuals of the newest version.

1.3 Volume Introduction

Softwares on MSR series routers fall into two versions: basic and standard. You can find lists of features supported on the two versions and the corresponding volumes of protocols or features you are interested in through feature indexes for these two versions respectively.

- Access Volume: Configuration of interfaces and link layer protocols supported on the router

- IP Services Volume: Configuration of IP-related features such as IP address, ARP, DNS, DHCP, IP performance, IP Unicast Routing, ACL, IPv6 Basics, NAT-PT and IPv6 over IPv4 Tunnel
- IP Routing Volume: Configuration of routing protocols such as static route, RIP, RIPng, OSPF, OSPFv3, IS-IS, BGP, BGP4+ and routing policy
- IP Multicast Volume: Configuration of IP multicast protocols such as IGMP, PIM, MSDP, multicast policy and MLD
- MPLS&VPN Volume: Configuration of MPLS and VPN related protocols such as MPLS, MPLS TE, GRE, BGP/MPLS IP VPN, MPLS L2VPN and VPLS
- QoS Volume: Configuration of QoS related protocols and features supported on the router, such as traffic classification, policing, and shaping, QoS policy, congestion management, priority mapping, congestion avoidance, MPLS QoS, DAR and Frame Relay QoS
- Security Volume: Configuration of security protocols such as AAA, user management, firewall, NAT, IPSec, IKE, RADIUS, HWTACACS and PORTAL
- System Volume: Configuration of system-related protocols and features such as basic system configuration, user login, file system management, system maintenance, NTP, SNMP, RMON, backup center, VRRP, NQA and MAC address table management
- IPX Volume: Configuration of IPX protocol supported on the router
- Voice Volume: Configuration of VoIP-related protocols and features such as H.323, SIP, FoIP, and dial policy

Chapter 2 Feature Description

2.1 Overview

H3C MSR Series Routers can be divided into three series: MSR 20, MSR 30 and MSR 50, which are positioned in ascending order. MSR 20 and MSR 30 series can be used as the edge access equipment of large networks or carrier networks, and the core of branches or small businesses; MSR 50 series can be used as the core of large and medium-sized enterprise networks as well as the edge/aggregation access equipment of large networks or carrier networks.

2.2 Functional Modules Index of Basic

Table 2-1 Functional modules index of standard

Functional module	Feature			
Access Volume	ATM and DSL interface	POS Interface	Ethernet Interface	WAN Interface
	ATM	DCC	DLSw	Frame Relay
	GVRP	HDLC	LAPB and X.25	Link Aggregation
	MODEM	Port Mirroring	PPP(PPP,PPPoE)	Bridging
	ISDN	MSTP	VLAN	Port Isolation
	Dynamic router backup	Logical interface		
IP Services Volume	ARP	DHCP(Server,Client)	DNS	IP Accounting
	IP Addressing	IP Performance	IP Unicast Policy-Routing	URPF
	Fast Forwarding	IPv6 Basics	Dual Stack	
IP Routing Volume	IP Routing Overview	BGP	OSPF	RIP
	Routing Policy	Static Routing	IPv6 Static Routing	

Functional module	Feature			
IP Multicast Volume	Multicast Overview	Multicast Routing and Forwarding	IGMP	MSDP
	PIM	IPv6 Multicast Routing and Forwarding	MLD	IPv6 PIM
MPLS&VPN Volume	GRE	L2TP		
QoS Volume	QoS			
Security Volume	802.1x	AAA RADIUS HWTACACS	Firewall	NAT
	PKI	PORTAL	Rsh	SSH1.5
	ACL	SSH2.0		
System Volume	GR	Backup Center	VRRP	Device Management
	NQA	NetStream	NTP	RMON
	SNMP	File System Management	System Maintaining and Debugging	Basic System Configuration
	Information Center	User Interface	MAC Address Table Management	

2.3 Functional Modules Index of Standard

Table 2-2 Functional modules index of Standard

Functional module	Feature			
Access Volume	ATM and DSL interface	POS Interface	Ethernet Interface	WAN Interface
	ATM	DCC	DLSw	Frame Relay
	GVRP	HDLC	LAPB and X.25	Link Aggregation
	MODEM	Port Mirroring	PPP	Bridging
	ISDN	MSTP	VLAN	Port Isolation
	Dynamic router backup	Logical interface	CPOS	

Functional module	Feature			
IP Services Volume	ARP	DHCP	DNS	IP Accounting
	IP Addressing	IP Performance	IP Unicast Policy-Routing	UDP Helper
	URPF	Fast Forwarding	IPv6 Basics	NAT-PT
	Dual Stack	Tunneling	IPv6 Unicast Policy Routing	Terminal Access
IP Routing Volume	IP Routing Overview	BGP	IS-IS	OSPF
	RIP	Routing Policy	Static Routing	IPv6 BGP
	IPv6 IS-IS	IPv6 OSPFv3	IPv6 RIPng	IPv6 Static Routing
IP Multicast Volume	Multicast Overview	Multicast Routing and Forwarding	IGMP	MSDP
	PIM	IPv6 Multicast Routing and Forwarding	MLD	IPv6 PIM
	Multicast VPN			
MPLS&VPN Volume	MPLS Basics	MPLS TE	MPLS L2VPN	MPLS L3VPN
	DVPN	GRE	L2TP	
QoS Volume	QoS			
Security Volume	802.1x	AAA RADIUS HWTACACS	Firewall	MAC Authentication
	NAT	PKI	PORTAL	Rsh
	ACL	IPSec	SSH2.0	SSL
System Volume	GR	Backup Center	VRRP	Device Management
	NQA	Automatic Configuration	NTP	RMON
	SNMP	File System Management	System Maintaining and Debugging	Basic System Configuration
	Information Center	User Interface	MAC Address Table Management	NetStream
	PoE	OAP Module	ACFP	ACSEI
	Track			

Functional module	Feature			
IPX Volume	IPX			
Voice Volume	Voice Overview	VoIP	Dial Plan	E1 and T1
	Fax over IP	H.323	SIP	VoFR
	Voice RADIUS	Call Services		

2.4 Feature Description

Note:

In the PDF version of this manual, you can click the hyperlink in the “Operation Manual” and “Command Manual” to access the operation and command manual you are interested in. Press <Alt + ←> to return to [Feature Description].

2.4.1 Access Volume

Table 2-3 Features in access volume

Feature	Operation and command manual	Feature description
ATM&DSL Interface	ATM and DSL Interface Configuration ATM and DSL Interface Commands	Introduction to interfaces such as ATM/DSL, IMA-E1/T1, ATM E3/T3, ATM OC-3c/STM-1, ADSL and G.SHDSL
POS Interface	POS Interface Configuration POS Interface Commands	POS configuration and introduction
Ethernet Interface	Ethernet Interface Configuration Ethernet Interface Commands	Combo, layer 2 and layer 3 Ethernet interface introduction
WAN Interface	WAN Interface Configuration WAN Interface Commands	Introduction to WAN interfaces such as Synchronous/asynchronous serial interface, AUX, AM, ISDN BRI, E1-F, T1-F, CE1/PRI, CT1/PRI, CE3 and CT3

Feature	Operation and command manual	Feature description
ATM	ATM Configuration ATM Commands	• Configuration of ATM, ATM subinterface and PVC and VP monitoring and management • Introduction to IPoA, PPPoA, IPoEoA and PPPoEoA supported on an ATM interface
DCC	DCC Configuration DCC Commands	Dial control center, a routing technology through which routers can interconnect with each other through public switching network (PSTN and ISDN). • DCC basic configuration • Configuration of DCC specific functions
DLSw	DLSw configuration DLSw Commands	• Configuring DLSw in Ethernet • Configuring DLSw in SDLC
Frame Relay	Frame Relay Configuration Frame Relay Commands	• FR DCE/DTE configuration • FR compression configuration • Multilink FR configuration • PPPoFR configuration • MPoFR configuration
GVRP	GVRP Configuration GVRP Commands	• GVRP function configuration • GARP timer configuration
HDLC	HDLC Configuration HDLC Commands	HDLC configuration
LAPB and X.25	LAPB and X.25 Configuration LAPB and X.25 Commands	• LAPB configuration • X.25 configuration • XOT configuration • X2T configuration
Link Aggregation	Link Aggregation Configuration Link Aggregation Commands	• Link aggregation classification • Load sharing mode in a link aggregation group • Link aggregation configuration
MODEM	MODEM Configuration MODEM Commands	MODEM management configuration
Port Mirroring	Port Mirroring Configuration Port Mirroring Commands	Local port mirroring configuration
PPP	PPP Configuration PPP Commands	• PPP configuration • MP configuration • PPP link efficiency mechanism configuration • PPPoE configuration

Feature	Operation and command manual	Feature description
Bridging	Bridging Configuration Bridging Commands	Isolation group configuration
ISDN	ISDN Configuration ISDN Commands	ISDN configuration
MSTP	MSTP Configuration MSTP Commands	• Root bridge configuration • Leaf node configuration • Performing mCheck • Digest snooping configuration • No Agreement Check configuration • Protection functions configuration
VLAN	VLAN Configuration VLAN Commands	• Basic VLAN attributes configuration • Configuration for VLAN interface basic attributes • Port-based VLAN configuration • Voice VLAN configuration
Port Isolation	Port Isolation Configuration Port Isolation Commands	Isolation group configuration
Dynamic Route Backup	Dynamic Route Backup Configuration Dynamic Route Backup Commands	• Dynamic Route Backup Configuration • Dynamic Route Backup Configuration Example
Logical Interface	Logical Interface Configuration Logical Interface Commands	• Dialer Interface • Loopback Interface • Null Interface • Sub-interface • Configuring MP-group Interfaces • Configuring MFR Interface • VT and VA Interface • Configuring VE
CPOS	CPOS Interface Configuration CPOS Interface Commands	• Configuring a CPOS Interface • Configuring an E1 Channel • Configuring a T1 Channel
Return to Functional Modules Index of Basic		

2.4.2 IP Services Volume

Table 2-4 Features in IP services volume

Feature	Operation and command manual	Feature description
ARP	ARP Configuration ARP Commands	Address resolution protocol, mainly used for resolution from IP address to Ethernet MAC address. • ARP configuration • Gratuitous ARP configuration • ARP source suppression configuration • Proxy ARP configuration
DHCP	DHCP Configuration DHCP Commands	Dynamic host configuration protocol, implements dynamic configuration for information such as IP address. • DHCP server configuration • DHCP relay configuration • DHCP client configuration • DHCP Snooping configuration • BOOTP client configuration
DNS	DNS Configuration DNS Commands	DNS is a distributed database that applies to TCP/IP application programs. It functions to resolve between hostnames and IP addresses. • Static DNS configuration • Dynamic DNS configuration
IP Accounting	IP Accounting Configuration IP Accounting Commands	IP accounting counts inbound and outbound IP packets on the router. IP accounting configuration
IP Addressing	IP Addressing Configuration IP Addressing Commands	• IP address configuration • Assigning an IP address to an interface
IP Performance	IP Performance Configuration IP Performance Commands	In a specific network, IP parameters need to be adjusted to optimize the network performance. • Enabling receiving and forwarding directed broadcasts • Configuration of TCP timer, buffersize, packet size and ICMP error packets
IP Unicast Policy-Routing	IP Unicast Policy-Routing Configuration IP Unicast Policy-Routing Commands	Policy routing, selects routes according to policies defined by the user. Policy routing configuration

Feature	Operation and command manual	Feature description
UDP Helper	UDP Helper Configuration UDP Helper Commands	UDP Helper functions to relay UDP broadcast packets to the specified server after converting them to unicast packets. UDP Helper configuration
URPF	URPF Configuration URPF Commands	Unicast reverse path finding, used to prevent the network attack based on source address spoofing. URPF configuration
Fast Forwarding	Fast Forwarding Configuration Fast Forwarding Commands	Fast forwarding employs cache and data-flow-based technology to handle packet forwarding. Fast forwarding configuration
IPv6 Basics	IPv6 Basics Configuration IPv6 Basics Commands	Internet protocol version 6 (IPv6) was designed by the Internet Engineering Task Force (IETF) as the successor to Internet protocol version 4 (IPv4). • Configuring basic IPv6 functions • IPv6 NDP configuration • PMTU discovery configuration • TCP6 configuration • IPv6 FIB forwarding configuration • IPv6 DNS configuration
NAT-PT	NAT-PT Configuration NAT-PT Commands	IPv4 networks and IPv6 networks will co-exist to communicate with each other for a long period of time. The network address translation – protocol translation (NAT-PT) realizes translation between IPv4 and IPv6 addresses to meet the communication requirement. NAT-PT configuration
Dual Stack	Dual Stack Configuration Dual Stack Commands	A network node that supports both IPv4 and IPv6 is called a dual stack node. A dual stack node configured with an IPv4 and an IPv6 addresses can have both IPv4 and IPv6 packets transmitted. • Dual stack configuration • Transition technology from IPv4 to IPv6

Feature	Operation and command manual	Feature description
Tunneling	Tunneling Configuration Tunneling Commands	Tunneling is an encapsulation technology, which utilizes one network transport protocol to encapsulate packets of another network transport protocol and transfer them over the network. • Manual/automatic IPv4-compatible IPv6 Tunnel • 6to4 tunnel configuration • ISATAP tunnel configuration • IPv4 over IPv4 tunnel configuration • IPv6 over IPv6 tunnel configuration • IPv4 over IPv4 tunnel configuration • 6PE configuration
IPv6 Unicast Policy Routing	IPv6 Unicast Policy Routing Configuration IPv6 Unicast Policy Routing Commands	IPv6 Unicast Policy Routing configuration
Terminal Access	Terminal Access Configuration Terminal Access Commands	• Introduction to Terminal Access • TTY Terminal Access Configuration • Telnet Terminal Access Configuration • RTC Terminal Access Configuration
Return to Functional Modules Index of Basic		

2.4.3 IP Routing Volume

Table 2-5 Features in IP routing volume

Feature	Operation and command manual	Feature description
IP Routing Overview	IP Routing Overview IP Routing Table Commands	IP routing overview • IP routing overview • IP routing and routing table • Routing through a routing table
BGP	BGP Configuration BGP Commands	A dynamic inter-AS route discovery protocol • Configuring BGP basic functions • Configuring BGP routing attributes • Configuring a large scale BGP network

Feature	Operation and command manual	Feature description
ISIS	IS-IS Configuration IS-IS Commands	An interior gateway protocol (IGP) used within an Autonomous System. It adopts the Shortest Path First (SPF) algorithm for route calculation. • Configuring ISIS basic functions • Configuring ISIS routing information control
OSPF	OSPF Configuration OSPF Commands	An interior gateway protocol based on link state • Configuring OSPF Basic Functions • Configuring OSPF Area Parameters • Configuring OSPF Network Types • Configuring OSPF Routing Information Management
RIP	RIP Configuration RIP Commands	A simple Interior Gateway Protocol mainly used in small-sized networks • Configuring RIP basic functions • Configuring RIP advanced functions
Routing Policy	Routing Policy Configuration Routing Policy Commands	Routing policy, used to change the route that network traffic passes. • Defining Filtering Lists • Configuring a Routing Policy
Static Routing	Static Routing Configuration Static Routing Commands	A special route that is manually configured by the network administrator. The proper configuration and usage of static routes can improve a network's performance and ensure bandwidth for important network applications. • Configuring a static route • Application
IPv6 BGP	IPv6 BGP Configuration IPv6 BGP Commands	BGP4+ puts IPv6 network layer information into the attributes of Network Layer Reachable Information (NLRI) and NEXT_HOP. • Configuring BGP4+ basic functions • Controlling route distribution and reception • Configuring BGP4+ route attributes
IPv6 ISIS	IPv6 IS-IS Configuration IPv6 IS-IS Commands	Supports multiple network protocols, including IPv6 and supports two Type-Length-Values (TLVs) and a new Network Layer Protocol Identifier (NLPID) • Configuring IPv6-IS-IS basic functions • Configuring IPv6-IS-IS routing information control

Feature	Operation and command manual	Feature description
IPv6 OSPFv3	IPv6 OSPFv3 Configuration IPv6 OSPFv3 Commands	OSPF protocol supporting IPv6 • Configuring OSPFv3 basic functions • Configuring OSPFv3 area parameters • Configuring OSPFv3 routing information management
IPv6 RIPng	IPv6 RIPng Configuration IPv6 RIPng Commands	An extension of RIP-2 for IPv4 • Configuring RIPng basic functions • Configuring RIPng advanced functions
IPv6 Static Routing	IPv6 Static Routing Configuration IPv6 Static Routing Commands	Special routes that are manually configured by network administrators work well in simple networks. Configuring IPv6 static routes
Return to Functional Modules Index of Basic		

2.4.4 IP Multicast Volume

Table 2-6 Features in IP multicast volume

Feature	Operation and command manual	Feature description
Multicast Overview	Multicast Overview	Multicast overview. Layer 2 multicast is not supported. • Multicast models • Framework of multicast • Multicast packets forwarding mechanism
Multicast Routing and Forwarding	Multicast Routing and Forwarding Configuration Multicast Routing and Forwarding Commands	Policies used for filtering the routing information used in the RPF check • Multicast policy overview • Configuring a multicast policy
IGMP	IGMP Configuration IGMP Commands	Internet group management protocol, a protocol in the TCP/IP suite responsible for management of IP multicast members. • Configuring basic functions of IGMP • Adjusting IGMP performance

Feature	Operation and command manual	Feature description
MSDP	MSDP Configuration MSDP Commands	Multicast source protocol, an interdomain multicast solution based on interconnection between multiple PIM-SM domains. • Configuring basic functions of MSDP • Configuring an MSDP peer connection • Configuring SA messages
PIM	PIM Configuration PIM Commands	Protocol independent multicast, provides IP multicast forwarding by leveraging unicast routes generated by any unicast routing protocols. • Configuring PIM-DM • Configuring PIM-SM • Configuring PIM-SSM • Configuring PIM Common Information
IPv6 Multicast Routing and Forwarding	IPv6 Multicast Routing and Forwarding Configuration IPv6 Multicast Routing and Forwarding Commands	Overview of IPv6 multicast
MLD	MLD Configuration MLD Commands	Used by an IPv6 router to discover the presence of multicast listeners on directly-attached subnets. • Configuring Basic Functions of MLD • Adjusting MLD Performance
IPv6 PIM	IPv6 PIM Configuration IPv6 PIM Commands	Protocol independent multicast for IPv6 • Configuring IPv6 PIM-DM • Configuring IPv6 PIM-SM • Configuring IPv6 PIM-SSM • Configuring IPv6 PIM Common Information
Multicast VPN	Multicast VPN Configuration Multicast VPN Commands	• Multicast VPN Overview • How MD-VPN Works • Configuring MD-VPN
Return to Functional Modules Index of Basic		

2.4.5 MPLS&VPN Volume

Table 2-7 Features in MPLS&VPN volume

Feature	Operation and command manual	Feature description
MPLS Basics Configuration	MPLS Basics Configuration MPLS Basics Commands	• MPLS configuration basics • LDP overview • Configuring MPLS basic capability • Configuring PHP • Configuring a static LSP • Configuring MPLS LDP • Configuring LDP instances • Configuring MPLS TTL processing
MPLS TE	MPLS TE Configuration MPLS TE Commands	• MPLS TE overview • Configuring MPLS TE basic capabilities • Creating MPLS TE tunnel over static CR-LSP • Configuring MPLS TE tunnel with dynamic signaling protocol • Configuring RSVP-TE advanced features • Tuning CR-LSP setup • Tuning MPLS TE tunnel setup • Configuring traffic forwarding • Configuring traffic forwarding tuning parameters • Configuring automatic bandwidth adjustment • Configuring CR-LSP backup • Configuring FRR
MPLS L2VPN	MPLS L2VPN Configuration MPLS L2VPN Commands	Supports multiple link-layer protocols to provide L2VPN services based on different media on an MPLS network. • Configuring MPLS L2VPN • Configuring CCC MPLS L2VPN • Configuring SVC MPLS L2VPN • Configuring Martini MPLS L2VPN • Configuring Kompella MPLS L2VPN

Feature	Operation and command manual	Feature description
MPLS L3VPN	MPLS L3VPN Configuration MPLS L3VPN Commands	MPLS VPN is a L3VPN technology based on PE in a VPN solution for carriers. • Configuring VPN instances • Configuring basic BGP/MPLS VPN • Configuring Inter-Provider VPN • Configuring Multi-Role Host • Configuring HoVPN • Configuring OSPF Sham Link • Configuring multi-VPN-instance CE • Configuring BGP AS number substitution
DVPN	DVPN Configuration DVPN Commands	DVPN overview and DVPN configuration • Configuring AAA • Configuring the VAM Server • Configuring the VAM Client • Configuring an IPSec Profile • Configuring the DVPN Tunnel Parameters • Configuring a DVPN Route
GRE	GRE Configuration GRE Commands	A protocol designed for performing encapsulation of one network layer protocol over another network layer protocol. • GER overview • Configuring a GRE over IPv4 tunnel • Configuring a GRE over IPv6 tunnel
L2TP	L2TP Configuration L2TP Commands	Defines an encapsulation mechanism for transporting multiprotocol packets over Layer 2 (L2) point-to-point links • LAC configuration • LNS configuration
Return to Functional Modules Index of Basic		

2.4.6 QoS Volume

Table 2-8 Features in QoS volume

Feature	Operation and command manual	Feature description
QoS	QoS Configuration QoS Commands	Quality of service, evaluates the service performance for those network core requirements during packet transmission process, such as: delay, jitter and packet loss ratio. Peak rate and hardware queues are not supported. • Traffic classification, policing, and shaping • QoS policy configuration • Congestion management • Priority mapping • Congestion avoidance • MPLS QoS configuration • DAR configuration • Frame Relay QoS configuration
Return to Functional Modules Index of Basic		

2.4.7 Security Volume

Table 2-9 Features in security volume

Feature	Operation and command manual	Feature description
802.1x	802.1x Configuration 802.1x Commands	802.1x is a port-based access control protocol. It authenticates and controls accessing devices at the level of port. • 802.1 basic configuration • 802.1x advanced configuration • Guest VLAN configuration
AAA RADIUS HWTACACS	AAA RADIUS HWTACACS Configuration AAA RADIUS HWTACACS Commands	Authentication, authorization and accounting (AAA) provide a uniform framework used for configuring these three security functions to implement the network security management. • AAA configuration • RADIUS configuration • HWTACACS configuration

Feature	Operation and command manual	Feature description
Firewall(ACL ASPF PAM)	Firewall(ACL ASPF PAM) Configuration Firewall(ACL ASPF PAM) Commands	Firewall can prevent unauthorized or unauthenticated users on the Internet from accessing a protected network while allowing the users on the internal network to access web sites on the Internet and transceive E-mails. • Configuring a Packet Filter Firewall • Configuring an ASPF
MAC Authentication	MAC Authentication Configuration MAC Authentication Commands	MAC address authentication controls user network access based on port and MAC address. • MAC authentication basic configuration • MAC authentication advanced configuration
NAT	NAT Configuration NAT Commands	Network Address Translation (NAT) is to translate the IP address in IP data packet header into another IP address, which is mainly used to implement private network accessing external network in practice. • Configuring EASY IP • Configuring static NAT • Configuring Many-to-many NAT • Configuring many-to-one NAPT • Configuring Internal Server • Configuring NAT Log • Configuring Connection Limit
PKI	PKI Configuration PKI Commands	Public key infrastructure (PKI) is a system which uses public key technology and digital certificate to protect system security and authenticate digital certificate users. • Generating an RSA pair for PKI • Configuring PKI certificate registration • Submitting a PKI certificate request • Configuring PKI certificate validation • Configuring access control policy of certificate attribute
PORTAL	Portal Configuration Portal Commands	Portal authentication • Portal authentication basic configuration • Portal authentication advanced configuration

Feature	Operation and command manual	Feature description
Rsh	Rsh Configuration Rsh Commands	Users can use the Rsh command to execute commands on the host of the client end. Rsh configuration
ACL	ACL Configuration ACL Commands	Access control list, to implement traffic identification function Traffic template is not supported. • Time-Based ACL • Basic IPv4 ACL configuration • Advanced IPv4 ACL configuration • Ethernet frame header ACL configuration • User-defined ACL configuration • Basic IPv6 ACL configuration • Advanced IPv6 ACL configuration
IPSec	IPSec Configuration IPSec Commands	Layer 3 tunnel encryption protocol defined by IETF, which provides security for IP data packets transmitted on the Internet. • Configuring an IPSec proposal • Configuring an IPSec policy • Configuring an IPSec policy template • Applying an IPSec policy • Configuring an encryption card IPSec policy • Configuring encryption engine • Configuring fast forwarding for encryption card • Configuring an IKE proposal • Configuring an IKE peer • Configuring IKE keepalive timer
SSH2.0	SSH2.0 Configuration SSH2.0 Commands	Security shell. When routers are connected by remote users across insecure networks, secure shell (SSH) can provide them authentication and security. • Configuring the SSH server • Configuring the SSH client • Configuring the device as an SSH client
SSL	SSL Configuration SSL Commands	Secure sockets layer • Configuring SSL server policy • Configuring SSL client policy
Return to Functional Modules Index of Basic		

2.4.8 System Volume

Table 2-10 Features in system volume

Feature	Operation and command manual	Feature description
GR	GR Overview	Perfect restart. When routing protocol is restarted, the forwarding service will not be terminated. Supports only FIB6, ISIS and BGP protocol-level GR
Backup Center	Backup Center Configuration Backup Center Commands	Module in charge of backup, providing backup for the device interface. • Introduction to backup center settings • Configuring Main/backup Mode • Configuring Loading Sharing
VRRP	VRRP Configuration VRRP Commands	Virtual routing redundancy protocol, with which the system can still provide highly reliable default links without changing configurations when a device fails. IPv6 based VRRP configuration
Device Management	Device Management Configuration Device Management Commands	Through the device management function, users can view the current working state of devices, configure operation parameters, and perform daily device maintenance and management. Validity check of BootROM is not supported. Configuring device management
NQA	NQA Configuration NQA Commands	Detects the availability and the response time of DHCP, FTP, HTTP, and SNMP services and provides test results • Configuring NQA Tests • Configuring Optional Parameters for NQA Tests • Enhanced Ping functions
NetStream	NetStream Configuration NetStream Commands	NetStream provides the packet statistics function. • Configuring NetStream Statistics • Configuring NetStream Aggregation Statistics • Configuring Attributes of NetStream UDP Packets • Configuring NetStream Statistics Aging

Feature	Operation and command manual	Feature description
NTP	NTP Configuration NTP Commands	Network time protocol, used for time synchronization between distributed time server and the client. • Configuring the operation modes of NTP • Configuring the local clock as a reference source • Configuring optional parameters of NTP • Configuring access-control rights • Configuring NTP authentication
RMON	RMON Configuration RMON Commands	Remote monitoring, making SNMP monitor remote network devices more effectively and proactively. RMON configuration
SNMP	SNMP Configuration SNMP Commands	Simple network management protocol, a frame using TCP/IP protocol suite to manage devices on the Internet • Configuring SNMP basic functions • Configuring Trap
File Management	File Management Configuration File Management Commands	Manages storage devices and store files in these devices. • File system management • Configuring FTP • Configuring TFTP
System Maintenance and Debugging	System Maintenance and Debugging Configuration System Maintenance and Debugging Commands	For the protocols and features supported on the device, the system provides corresponding debugging functions to help users diagnose and locate errors • Configuring system debugging • Configuring ping and tracert
Basic System Configuration	Basic System Configuration Operation Basic System Configuration Commands	Basic system configuration
Information Center	Information Center Configuration Information Center Commands	Acting as the system information hub, information center classifies and manages system information. Configuring the information center

Feature	Operation and command manual	Feature description
User Interface	User Interface Configuration User Interface Commands	User interface view is a feature that allows you to manage asynchronous serial interfaces that work in flow mode. By operating under user interface view, you can centralize the management of various configurations. • Configuring asynchronous interface attributes • Configuring terminal attributes • Configuring modem attributes • Configuring the auto-execute command • Configuring user privilege level • Configuring access restriction to VTY user interfaces • Configuring supported protocols on VTY user interfaces • Configuring redirection function on the asynchronous serial interface • Configuring authentication mode at login
MAC Address Table Management	MAC Address Table Management Configuration MAC Address Table Management Commands	A device maintains a MAC address table for frame forwarding. Each entry in this table indicates the MAC address of a connected device, to which interface this device is connected and to which VLAN the interface belongs. Configuring the MAC address table
Automatic Configuration	Automatic Configuration	Introduction to Automatic Configuration
POE	POE Configuration POE Commands	Introduction to PoE
OAP Module	OAP Module Configuration OAP Module Commands	OAP Module Overview
ACFP	ACFP Configuration ACFP Commands	Introduction to ACFP and configuration
ACSEI	ACSEI Configuration ACSEI Commands	ACSEI server configuration and ACSEI client configuration

Feature	Operation and command manual	Feature description
Track	Track Configuration Track Commands	Track overview and configuration
Return to Functional Modules Index of Basic		

2.4.9 IPX Volume

Table 2-11 Features in IPX volume

Feature	Operation and command manual	Feature description
IPX	IPX Configuration IPX Commands	IPX is a connectionless protocol. Such functions as confirmation of forwarding success and connection control are provided by the protocol at the layer above IPX. • Configuring IPX basic functions • Configuring IPX routing • Configuring IPX SAP • Configuring the IPX Forwarding Feature
Return to Functional Modules Index of Basic		

2.4.10 Voice Volume

Table 2-12 Features in voice volume

Feature	Operation and command manual	Feature description
VoIP Overview	VoIP Overview	Introduction to VoIP • Basic VoIP call flow • Configuring VoIP features • Voice subscriber line • Voice entity • Protocol • Dial plan
VoIP	VoIP Configuration VoIP Commands	The application of VoIP on routers makes it possible for an IP network to carry voice services. • Configuring voice subscriber line • Configuring voice entity

Feature	Operation and command manual	Feature description
Dial Plan	Dial Plan Configuration Dial Plan Commands	A dial program can help voice gateways to manage numbers in a unified way and create a management policy for all numbers, making number management more convenient and reasonable. • Dial plan process • Dial plan configuration
E1 and T1	E1 and T1 Configuration E1 and T1 Commands	E1/T1 voice implements VoIP on E1/T1 line, allowing the router to provide more channels of voice communication, greatly improving router utilization and broadening service range. • E1/T1 interface • E1/T1 voice functions • E1/T1 configuration
Fax over IP	Fax over IP Configuration Fax over IP Commands	Implements sending and receiving of fax over the Internet • Introduction to FoIP • FoIP configuration
H.323	H.323 Configuration H.323 Commands	GK (gate keeper) configuration for H.323 voice gateway, combining the voice gateway with GK, thus implementing the VoIP function. • Introduction • H.323 architecture • H.323 gateway configuration
SIP	SIP Configuration SIP Commands	Session initiation protocol, an application layer protocol used for initiating, modifying and stopping a multimedia session • Introduction to SIP • Introduction to SIP configuration tasks • Basic SIP UA configuration • Advanced SIP UA configuration
VoFR	VoFR Configuration VoFR Commands	Voice over frame relay enables a router to transmit voice and voice-band data over a frame relay network. • Configuring VoFR Entity • Configuring VoFR Voice Bandwidth • Configuring Dynamic Mode • Configuring FRF.11 Trunk Mode

Feature	Operation and command manual	Feature description
Voice RADIUS	Voice RADIUS Configuration Voice RADIUS Commands	Voice RADIUS configuration
Call Services	Call Services Configuration Call Services Commands	• Configuring Call Waiting • Configuring Call Hold • Configuring Call Forwarding • Configuring Call Transfer • Configuring Hunt Group • Configuring Incoming Call Barring • Configuring Outgoing Call Barring • Configuring FEATURE Service • Configuring a Number Priority Peer
Return to Functional Modules Index of Basic		

Chapter 3 Logging onto MSR Series Routers

3.1 Logging onto an MSR Series Router

You can log onto the MSR 20/30/50 series routers in the following ways:

- Local login through Console port
- Telneting to the router through an Ethernet interface
- Remote login through AUX port or TTY port using Modem dialup
- Login through NMS

Local login through Console port and telneting to the router through an Ethernet interface are the most frequently used login methods in application. In this manual we introduce these two login methods in details.

3.1.1 Local Login Through the Console Port

I. Setting up local configuration environment

To set up the local configuration environment, RJ-45 connector of the console cable needs to be connected to the console port on the router, and DB-9 connector to the serial interface of a PC, as shown in the following figure.

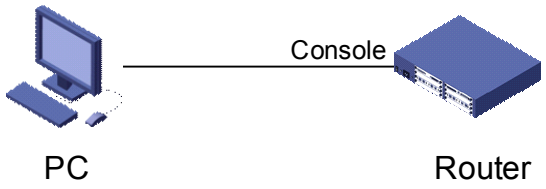

Figure 3-1 Local login through the console port

II. Setting the parameters for the console terminal

Set terminal parameters, taking the hyper terminal on Windows as an example. In the Serial Attribute dialog box, set the baud rate to 9600, data bit to 8, no parity check, stop bit to 1, and flow control to none. As shown in the following figure:

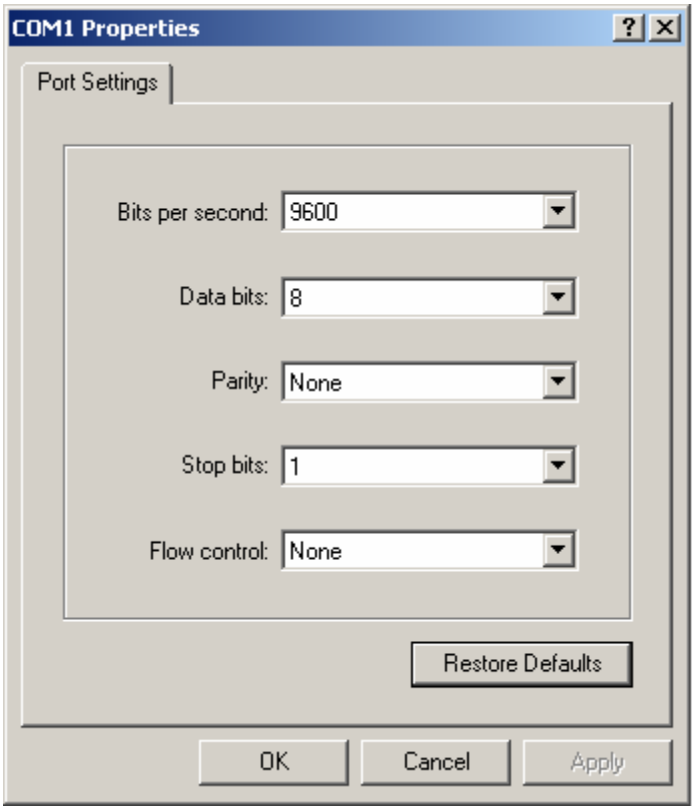

Figure 3-2 Setting serial interface parameters

Select the terminal emulation type to be VT100 or auto detect.

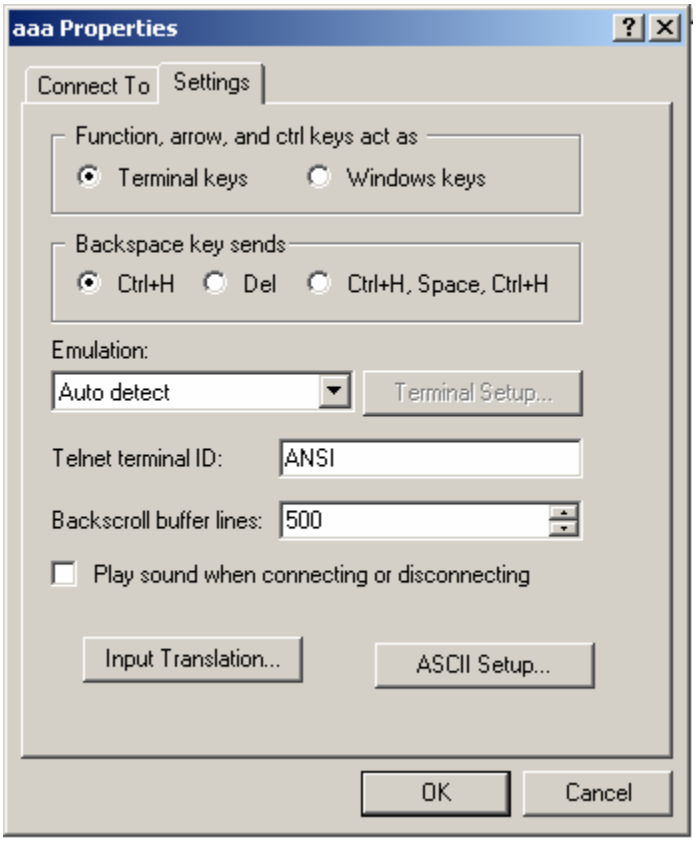

Figure 3-3 Setting terminal type

After setting all parameters, click [Enter], and you can configure the router.

3.1.2 Telneting to the Router Through the Ethernet Interface

I. Setting up configuration environment

Connect the router to a network through the Ethernet interface.

Figure 3-4 Telnet to the server

II. Configuring the router

Before you perform remote login onto the router, you must configure the router. You must perform local configuration through Console port when you first configure the router.

Perform the following configuration on the router:

Enter system view.

```
Press ENTER to get started.
<H3C>system-view
```

Enable Telnet server.

```
[H3C]telnet server enable
% Start Telnet server
```

Configure the IP address of the interface that connects to the Internet. You can change this IP address to what is in use.

```
[H3C]interface ethernet0/0
[H3C-ethernet0/0]ip address 192.168.0.1 24
```

Enter vty interface view.

```
[H3C]user-interface vty 0
```

Set login password to 123456 and priority to 2.

```
[H3C-ui-vty0]set authentication password cipher 123456
[H3C-ui-vty0]user privilege level 2
```

III. Logging onto the router

Ensure the reachability between the terminal and the router, and then you can log onto the router remotely.

```
**************************************************************************
* All rights reserved (2004-2006)                                        *
* Without the owner's prior written consent,                             *
* no decompiling or reverse-engineering shall be allowed.                *
**************************************************************************


Login authentication


Password:
<H3C> system-view
[H3C]
```

Enter password 123456 when the system prompts entering the password. You can perform operations on the router after entering the correct password.

3.2 Introduction to User Interface

3.2.1 User Interface Supported on MSR Series Routers

Table 3-1 Introduction to user interface

User interface	Corresponding user	Port type	Description
Console user interface	User logging through Console port	Console port	There is only one Console user for each router
TTY user interface	User logging through TTY interface	TTY interface	Different products support different numbers of users. Use the **display user-interface** command to check it.
AUX user interface	User logging through AUX port	AUX port	There is only one AUX user for each router
VTY user interface	Telnet user and SSH user	Ethernet interface	Up to five VTY users can be supported by each router.

3.2.2 User Interface Numbering for the Router

User interface of the system falls into four categories, and is arranged in certain order:

They are Console (CON), Auxiliary port (AUX), virtual interface (VTY) and physical terminal interface (TTY).There is only one user interface for console and auxiliary port, while multiple user interfaces for VTY and TTY interface, each type of these multiple user interfaces being arranged in order.

User interface is numbered in the following two ways: absolute number and relative number.

1) Absolute number

The beginning number of absolute number is 0 (Namely, Console port), and the rest interfaces can be deduced by analogy. Console port and Aux port occupy one number respectively; For VTY interface and TTY interface, different products support different numbers of user interfaces. Use the **display user-interface** command to view them. Absolute number can uniquely specify one user interface or one group of user interfaces.

- Console user interface is numbered 0.

- TTY user interface is numbered after Console user interface and before Aux user interface.
- Number of AUX user interface is the absolute number of TTY plus one.
- VTY user interface is numbered after AUX user interface. Absolute number of the first VTY is incremented by 1 than the AUX user interface number.

2) Relative number

Relative number, represented by "+ number" assigned to each type of user interface. It follows the rules below:

- Console user interface is numbered CON 0.
- Number of TTY user interface: The first TTY user interface is designated as TTY0, the second one is designated as TTY1 and so on.
- AUX user interface is numbered AUX 0.
- Number of VTY user interface: The first VTY user interface is designated as VTY0, the second one is designated as VTY1 and so on.

Chapter 4 Registering the Software

Software register is provided on the device to protect the authorized users' legal rights to use the software. Trial period is set on the software with this function and users are required to register the serial number of the software in the trial period. If the software has not been registered until the trial period expires, the system automatically restarts every 30 minutes.

You can obtain a registration serial number through buying letter of authorization of the software.

You can use the **license register** *serial-number* command or log onto the network management interface and then enter the serial number to finish software registration; and you can use the **display license** command or log onto the network management interface to view the soft registration information of the device.

Follow these steps to register the software:

To do...	Use the command...	Remarks
Register the software	**license register** *serial-number*	Required Available in user view
Display the information	**display license**	any view

Chapter 5 Software Maintenance

Note:

This manual uses H3C MSR 50 series routers as an example.

5.1 Introduction

5.1.1 Files

I. BootROM program file

The file is used for booting application at boot. A complete BootROM file includes two segments: basic and extended.

II. Application program file

The router is available with Dual Image function. By default, the system defines and attempts to boot in order with three boot files: main, backup, and secure, provided they are available with CF card. If the router fails to boot with the secure boot file, it prompts the boot failure. For more information about the boot files, refer to section 5.7 "Maintaining Application Program and Configuration File".

The following table gives default names and types of boot files.

Table 5-1 Default names and types of the boot files

Boot file	File name	File type
Main boot file	main.bin	M
Backup boot file	backup.bin	B
Secure boot file	secure.bin	S

Note:

- The application programs for system boot can be type M, B and S, but not type N. You can store them in Flash memory, but only one for each. For example, if an M+B file exists, it is impossible to have another M or B file. If you change the file type of another file to B, the M+B file becomes a type M file.
- You can modify the file name of an application file in CF card using the command after it boots. You cannot modify the file type of a type S application image file, but you can modify the file type of type M/B and N application program files in the BootROM menu or using commands after the application program boots.
- Secure boot file is the last resort for system boot. You can download it in the BootROM menu and must name it secure.bin. However, you cannot modify this file or change the type of another file to S. If you change the name of the secure boot file with the **rename** command after the system boots, the file is removed from CF card. To use the secure boot file after that, you need to download it again.

III. Configuration file

The file stores configuration information of the router.

By default, the system defines and attempts to boot in order with three configuration files: main, backup, and default, provided they are available with CF card. If the router fails to boot with the secure boot file, it prompts the boot failure. For more information about the boot files, refer to section 5.7 "Maintaining Application Program and Configuration File".

The following table describes the three configuration files.

Table 5-2 Description on the three configuration files

Configuration file	File type	Description
Main configuration file	M	Used by the system for booting by default.
Backup configuration file	B	Used by the system for booting when it fails to boot with the main configuration file.
Default configuration file	M/B/N	Used by the system for booting when it fails to boot with the backup configuration file. If the system fails to boot with the default configuration file, it boots with null configuration. The name of the default configuration file has something to do with the router brand. The main and backup configuration operations on the default configuration file is the same with common configuration files.

Note:

- The configuration files for system boot can be type M, B and default configuration file of type N, but not non-default configuration file of type N (i.e. neither M nor B).
- You can modify the file name of a configuration file in CF card using the command after it boots. You cannot modify the type of the default configuration file, but you can modify the file type of type M/B and N configuration files in the BootROM menu or using commands after the application program boots.

You can store them in Flash memory, but only one for each. For example, if an M+B file exists, it is impossible to have another M or B file. If you change the file type of another file to B, the M+B file becomes a type M file.

Caution:

- The file name cannot be longer than 64 characters (including drive letter and a string terminator. If the drive letter is “CF:/”, the file name can be at most [64-1-4] = 59 characters in length; or, errors will occur in file operation. Typically, the file name is recommended to be not more than 16 characters.
- The extension ASCII characters (ASCII>=128) and invisible characters (ASCII<33) cannot be included in the file name.
- The following characters cannot be included in the file name: ”, ‘, ?, \, space, *, |, <, /, :, >, ~.
- The character “.” can be included in the file name, but cannot be the first or last character of the file name. Two consecutive “.”s are not allowed.

5.1.2 Software Maintenance Methods

I. Upgrading BootROM and application program using XMODEM protocol through an serial interface.

II. Upgrading application program from TFTP/FTP server through an Ethernet interface in BootROM.

III. Uploading/downloading application program and configuration file from TFTP/FTP server via command lines.

Note:

- BootROM program is upgraded through binding with the Comware version. You do not need to upgrade it separately. The system automatically upgrades BootROM to be the latest version while upgrading Comware.
- Check the current version of BootROM and application program before upgrading. For the association between Comware version and BootROM program, see the corresponding *Release Notes*.

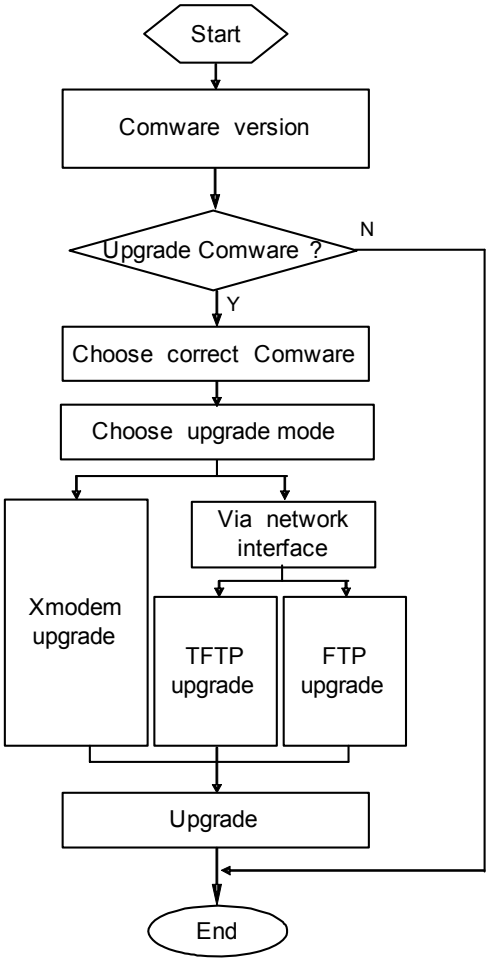

Figure 5-1 Upgrade BootROM and Comware under Comware V5 environment

5.2 BootROM Menu

5.2.1 Main BootROM Menu

When the router is powered on and reboots, the console terminal displays:

```
InitDDR
```

Proceed to boot, and the system prompts:

```
system start booting......Version  2.11
Press CTRL+D to stop auto-boot
Booting Normal Extend BootRom
Decompressing...done!
Ensure the baudrate is set to 9600bps!Starting at 0xa00000...


      ******************************************************
      *                                                    *
      *         H3C MSR50-40 BOOTROM, Version 2.11         *
      *                                                    *
      ******************************************************

      Copyright(c) 2004-2007 Hangzhou H3C Technology Co., Ltd.
      Compiled date: Apr 09 2007, 08:52:28
      CPU type        : MPC8541
      CPU L1 Cache    : 32KB
      CPU L2 Cache    : 256KB
      CPU Clock Speed : 833MHz
      Memory Type     : DDR SDRAM
      Memory Size     : 512MB
      Memory Speed    : 333MHz
      BootRom Size    : 4096KB
      CPLD     Version is   1.00
      HardWare Version is   3.00
CF Card is Inserted, now is mounting...
cf:/  - Volume is OK
Mount CF Card OK!
CF Card Size:256MByte
Press Ctrl+B to enter extended boot menu...
```

Note:

The extended BootROM menu is referred to as main BootROM menu in this manual except for special statement.

Press <Ctrl+B> when it displays “Press Ctrl+B to enter extended boot menu...”. Then, the system prompts:

```
Please input Boot ROM password:
```

You have three chances to provide the correct BootROM password (the initial setting is void). If you fail to do that, you need to reboot the system. After you enter the correct password, the console screen displays.

```
==================<EXTEND-BOOTROM MENU>====================
| <1> Boot From CF Card                                    |
| <2> Enter Serial SubMenu                                 |
| <3> Enter Ethernet SubMenu                               |
| <4> File Control                                         |
| <5> Modify Bootrom Password                              |
| <6> Ignore System Configuration                          |
| <7> Boot Rom Operation Menu                              |
| <8> Clear Super Password                                 |
| <9> Device Operation                                     |
| <a> Reboot                                               |
============================================================
Enter your choice(1-a):
```

The menu is defined as follows:

Table 5-3 Main BootROM menu

Menu item	Description
<1> Boot From CF Card	Boot from the CF card.
<2> Enter Serial SubMenu	Enter serial submenu. Refer to section 5.2.2 I. "Enter serial submenu" for details.
<3> Enter Ethernet SubMenu	Enter Ethernet submenu. Refer to section 5.2.2 II. "Enter Ethernet interface submenu" for details.
<4> File Control	File control submenu. Refer to section 5.2.2 III. "File control submenu" for details.
<5> Modify Bootrom Password	Modify BootROM password.
<6> Ignore System Configuration	Ignore system configuration.
<7> Boot Rom Operation Menu	BootROM operation submenu. Refer to section 5.2.2 IV. "BootROM operation submenu" for details.
<8> Clear Super Password	Delete super password.
<9> Device Operation	Device Operation menu, which is used to select memory device.
<a> Reboot	Reboot the router.

5.2.2 BootROM Submenus

I. Enter serial submenu

This submenu can be used for upgrading application program, changing serial baud rate, and other operations.

Enter <2> under the main BootROM menu to enter the serial submenu:

```
======================<SERIAL SUB-MENU>=====================
|Note:the operating device is CF Card                       |
| <1> Download Application Program To SDRAM And Run         |
| <2> Update Main Application File                          |
| <3> Update Backup Application File                        |
| <4> Update Secure Application File                        |
| <5> Modify Serial Interface Parameter                     |
| <6> Exit To Main Menu                                     |
=============================================================
Enter your choice(1-6):
```

The menu is defined as follows:

Table 5-4 BootROM serial submenu

Menu item	Description
<1> Download Application Program To SDRAM And Run	Download the application program to SDRAM and run it.
<2> Update Main Application File	Upgrade the main application file.
<3> Update Backup Application File	Upgrade the backup application file.
<4> Update Secure Application File	Upgrade the secure application file.
<5> Modify Serial Interface Parameter	Modify serial interface parameter.
<6> Exit To Main Menu	Exit to the main menu.

II. Enter Ethernet interface submenu

Enter <3> in BootROM menu to enter the Ethernet interface submenu. The system displays:

```
====================<ETHERNET SUB-MENU>=====================
|Note:the operating device is CF Card                       |
| <1> Download Application Program To SDRAM And Run         |
| <2> Update Main Application File                          |
| <3> Update Backup Application File                        |
| <4> Update Secure Application File                        |
| <5> Change Ethernet Parameter                             |
| <6> Exit To Main Menu                                     |
```

```
| < Ensure The Parameter Be Modified Before Downloading! >  |
==============================================================
Enter your choice(1-6):
```

The menu is defined as follows:

Table 5-5 Enter Ethernet interface submenu

Menu item	Description
<1> Download Application Program To SDRAM And Run	Download application program to SDRAM and run it.
<2> Update Main Application File	Upgrade the main application file.
<3> Update Backup Application File	Upgrade the backup application file.
<4> Update Secure Application File	Upgrade the secure application file.
<5> Change Ethernet Parameter	Modify Ethernet parameters.
<6> Exit To Main Menu	Exit to the main menu.

III. File control submenu

Enter <4> under the main BootROM menu to enter the file control submenu. Through this submenu, the system can display application program file type in memory, modify file name and delete files. The prompt is shown below:

```
=========================<File CONTROL>=======================
|Note:the operating device is CF Card                        |
| <1> Display All File                                       |
| <2> Set Application File type                              |
| <3> Set Configuration File type                            |
| <4> Delete File                                            |
| <5> Exit To Main Menu                                      |
==============================================================
```

Enter your choice(1-5):

The submenu is defined as follows:

Table 5-6 File control submenu

Menu item	Description
<1> Display All File	Display all files.
<2> Set Application File type	Set application file type.
<3> Set Configuration File type	Set configuration file type.
<4> Delete File	Delete files.

Menu item	Description
<5> Exit To Main Menu	Exit to the main BootROM menu.

IV. BootROM operation submenu

Enter <7> under the main BootROM menu to enter the BootROM operation menu:

```
======================<BOOT ROM OPERATION>====================
|Note:the operating device is CF Card                         |
| <1> Backup Full Boot ROM                                    |
| <2> Restore Full Boot ROM                                   |
| <3> Update Full Boot ROM With XModem                        |
| <4> Update Extended Boot ROM With XModem                    |
| <5> Update Basic Boot ROM With XModem                       |
| <6> Exit To Main Menu                                       |
| Note:When Update Full/Extended/Basic BootRom,they are the   |
|      same file                                              |
============================================================
Enter your choice(1-6):
```

The submenu is defined as follows:

Table 5-7 BootROM operation submenu

Menu item	Description
<1> Backup Full Boot ROM	Backup full BootROM.
<2> Restore Full Boot ROM	Restore full BootROM.
<3> Update Full Boot ROM With XModem	Update full BootROM through XMODEM.
<4> Update Extended Boot ROM With XModem	Update extended BootROM through XMODEM.
<5> Update Basic Boot ROM With XModem	Update basic BootROM through XMODEM.
<6> Exit To Main Menu	Exit to the main menu.

5.3 Upgrading BootROM Through Serial Interface

Use XMODEM to upgrade BootROM through serial interface.

5.3.1 Modifying Serial Interface Parameters

Sometimes, we need to change the serial baud rate to higher in order to save upgrading time, or to lower to guarantee transmission reliability. This section depicts how to adjust serial baud rate.

Enter <2> under the main BootROM menu to enter the serial submenu. Then, enter <5>, and the system prompts to change serial baud rate.

```
========================<BAUDRATE SET>=======================
|Note:  Change The HyperTerminal's Baudrate Accordingly,    |
|       Press 'Enter' to exit with things untouched.        |
|--------------------<Baudrate Avaliable>------------------|
| <1> 9600(Default)                                         |
| <2> 19200                                                 |
| <3> 38400                                                 |
| <4> 57600                                                 |
| <5> 115200                                                |
| <6> Exit                                                  |
=============================================================
Enter Your Choice(1-6):
```

Select a baud rate, <5> for 115200 bps for example. The following prompt appears:

```
Change the baudrate on PC side first!
```

Since the router serial baud rate is modified to 115200 bps, whereas the terminal baud rate remains to be 9600 bps, they can not communicate with each other. Change the baud rate of your terminal to the same as that for software download.

Perform the following operation:

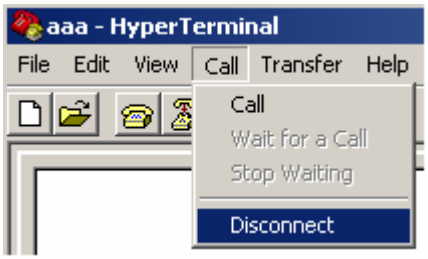

Figure 5-2 Disconnect terminal

Click [File/Properties], and press <Configure…> to change baud rate to 115200 bps:

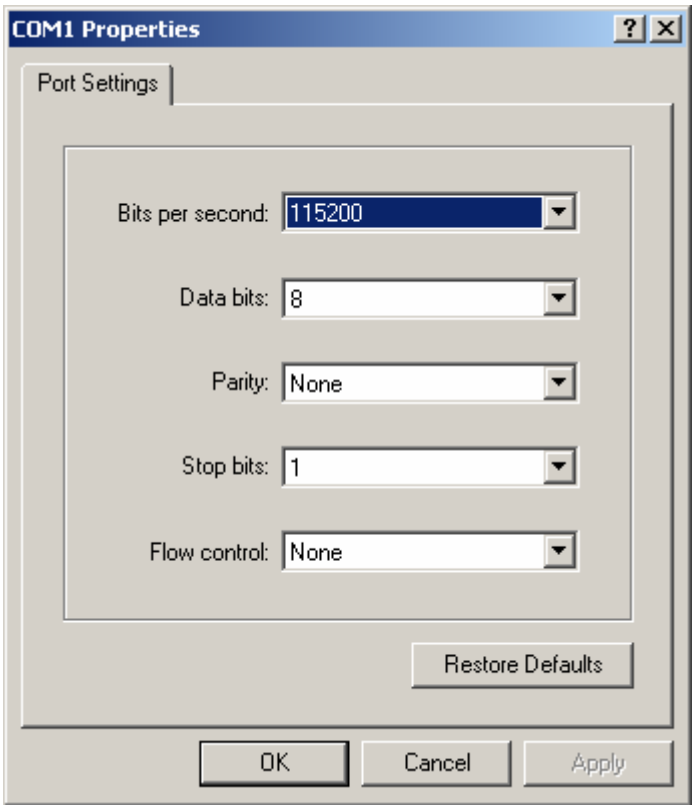

Figure 5-3 Modify baud rate

Click [Call/Call] to establish new connection.

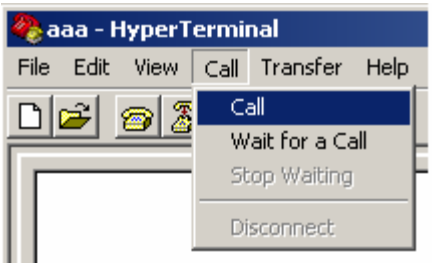

Figure 5-4 Establish new connection

Then, press <Enter> to prompt current configuration baud rate and return to the previous menu.

The system prompts:

```
The current baudrate is 115200
```

Note:

Restore the baud rate in the HyperTerminal to 9600 bps (the default) after upgrading the BootROM. This is to ensure that information can be displayed on the console screen after system boot or reboot.

5.3.2 Upgrading BootROM

First, enter <7> under the main BootROM menu (refer to section 5.2.1 "Main BootROM Menu") to enter the BootROM operation submenu, under which all BootROM operations are completed. Refer to section 5.2.2 IV. "BootROM operation submenu" for detailed descriptions.

For example, when you upgrade full BootROM:

First, change serial baud rate to speed up upgrading (refer to section 5.3.1 "Modifying Serial Interface Parameters" for details), and then enter <3> under BootROM operation menu. The system prompts:

```
Select program file please.
Waiting...CC
```

Select [Transfer/Send file…] in the [HyperTerminal] window. The following window pops up:

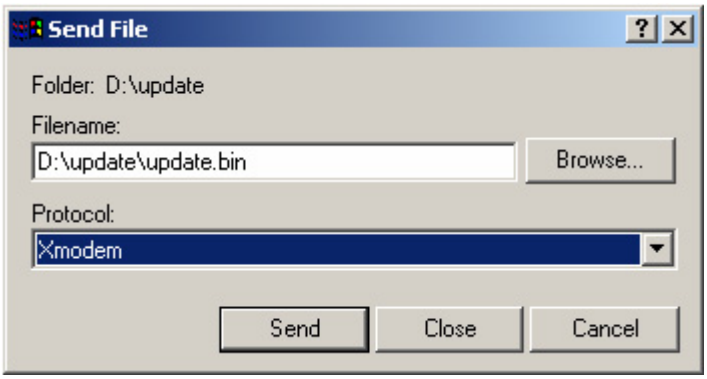

Figure 5-5 Send File dialog box

In the displayed [Send File] dialog box, click <Browse…> to select the application program file to be downloaded, and select XMODEM for the [Protocol] field. Then click <Send>. The following interface appears:

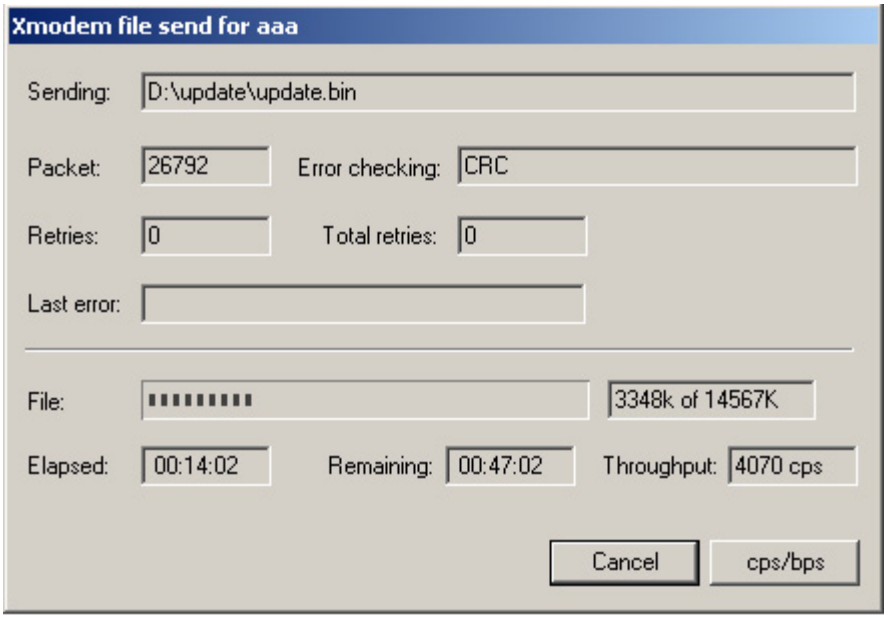

Figure 5-6 Sending File interface

```
After completing download, the following information appears on terminal
interface to indicate download and upgrade success:
Download successfully!
434432 bytes downloaded!
Updating Extend BTM
Updating Extended BootRom.
```

Note:

- The file name, size and path vary in different situations. Check the current version of BootROM and application program in order to use correct file.
- This method only upgrades a part of BootROM. You can re-upgrade when error occurs.

5.4 Upgrading Application Program Through Serial Interface

Upgrading of application program through serial interface is implemented under serial submenu. Enter <2> under the main BootROM menu to enter the serial submenu. Refer to section 5.2.2 I. "Enter serial submenu" for detailed descriptions.

For example, when you upgrade application program:

First, change serial baud rate to speed up upgrading (refer to section 5.3.1 "Modifying Serial Interface Parameters" for details), and then enter <2> under serial submenu. The system prompts:

```
Select program file please.
Waiting...CC
```

Select application program file and send it. Upgrading application program with serial port takes the similar steps with upgrading BootROM. Refer to section 5.3.2 "Upgrading BootROM" for details.

Note:

Application program often takes over 10M.Even if the baud rate is changed to 115200 bps, the upgrading takes about 30 minutes. Therefore, it is recommended you upgrade through Ethernet interface.

5.5 Upgrading Application Program Through Ethernet Interface

Enter <3> under the main BootROM menu to enter the Ethernet interface submenu. Refer to section 5.2.2 II. "Enter Ethernet interface submenu" for details.

5.5.1 Configuring Ethernet Parameters

Before upgrading application program through Ethernet interface, we need to configure the Ethernet interface of the router, as follows:

Enter <3> under the main BootROM menu to enter the Ethernet Interface submenu. Then, enter <5> to enter the Configure Ethernet interface menu:

```
Note: Two protocols for download, tftp & ftp.
      You can modify the flags following the menu except the boot device.
      tftp--0x80, ftp--0x0.

'.' = clear field;  '-' = go to previous field;  Ctrl+D = quit
boot device        : mottsec0            Boot device name. Cannot be changed.
processor number     : 0                   Processor number. Keep unchanged.
host name            : host                     Host name. Keep unchanged.
file name            : main.bin              The download file name shall be
consistent with the real file name, and you are asked to designate download
path. Or you can designate download path in FTP and TFTP settings.
inet on ethernet (e) : 192.168.80.10          Set to be in the same network
with TFTP/FTP server. It has nothing to do with port IP address of the router.
inet on backplane (b):                         No need to set.
host inet (h)        : 192.168.80.200        IP address of FTP/TFTP server.
gateway inet (g)     :                       Gateway IP address. No need to
set.
```

```
user (u)            : guest                 User name FTP downloaded is used
in this setting. No need to consider in TFTP download.
ftp password (pw) (blank = use rsh): 123456   FTP downloads password. No need
to consider in TFTP download.
flags (f)           : 0x80                  Download flag. The flag is 0x0
with FTP download, and 0x80 with TFTP download.
target name (tn)    :                      No need to set. If set, it means
the target file name saved in Flash memory. Alternatively, you may choose not
to enter any name and use the file name used for the last upgrade instead.
startup script (s)  :                         No need to set.
other (o)           :No need to set.
```

Note:

- When configuring parameters, enter new parameters directly; or press <ENTER> to accept the default parameter coming after the colon, “.” for “clear field”, “-” for “go to previous filed", and “Ctrl+D” for “quit”.
- Upon failure, the system prompts:

```
        Loading failed
  Please reboot the router to validate the reset IP address.
```

- Do not modify the device name of the router; otherwise, the system prompts "Boot device should not be modified" and skips to the next configuration item.
- Only FE0 port can be used in MSR 20 routers, and GE0 port in MSR 30 and MSR 50 routers.

5.5.2 Upgrading Application Program Through Ethernet Interface

TFTP (Trivial File Transfer Protocol) is a protocol of the TCP/IP suite that is used to transfer trivial files between clients and the server. It provides not-so-complex and low-cost file transfer services. Carried over UDP, TFTP provides unreliable data transfer services and does not provide access authorization and authentication mechanism. It employs timeout retransmission to guarantee the successful transferring of data. TFTP takes much smaller size than FTP.

As an application layer protocol in the TCP/IP suite, FTP (File Transfer Protocol) mainly transfers files among remote hosts. Carried over TCP, it provides reliable and connection-oriented data transfer service but does not provide access authorization and authentication mechanism.

Step 1: Set up an upgrade environment.

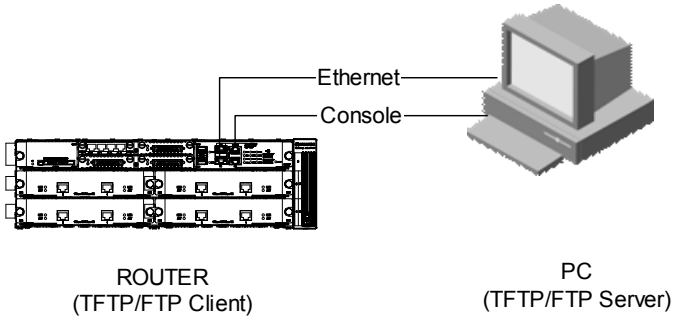

Figure 5-7 Set up FTP/TFTP upgrade environment

Connect Ethernet port 0/0 to a PC by using a crossover cable. Start TFTP/FTP program on the PC as the server, and set the path of TFTP/FTP server to point to the address of application program. You need to set user name and password if FTP server is used.

⚠ **Caution:**

No TFTP/FTP Server is available with the H3C MSR 50 series. You must install one yourself.

Step 2: Modify Ethernet parameters. Refer to section 5.5.1 "Configuring Ethernet Parameters" for details.

Step 3: Enter <3> to enter Ethernet submenu. For example, when upgrading main application program, enter <2> to upgrade:

```
Loading...
Done!
14323376 bytes downloaded.
Input the File Name:
```

After the download is done, input the file name and begin to update:

```
Updating File main.bin........
Update Success!
```

Step 4: Enter <6> to exit to the main BootROM menu. Enter <1> to boot from the CF card.

Step 5: Set the updated application program to be the main boot file, i.e. the default boot file of the system.

```
  Application program does not exist.
  Now starting to download application program.
==================<EXTEND-BOOTROM MENU>====================
| <1> Boot From CF Card                                    |
```

```
| <2> Enter Serial SubMenu                                   |
| <3> Enter Ethernet SubMenu                                 |
| <4> File Control                                           |
| <5> Modify Bootrom Password                                |
| <6> Ignore System Configuration                            |
| <7> Boot Rom Operation Menu                                |
| <8> Clear Super Password                                   |
| <9> Device Operation                                       |
| <a> Reboot                                                 |
==============================================================
Enter your choice(1-a):4
```

The system reboots. Enter <4> when it prompts the above information.

```
========================<File CONTROL>=======================
|Note:the operating device is CF Card                        |
| <1> Display All File                                       |
| <2> Set Application   File type                            |
| <3> Set Configuration File type                            |
| <4> Delete File                                            |
| <5> Exit To Main Menu                                      |
==============================================================
Enter your choice(1-5):2
```

Enter the file control submenu and enter <2> to set the application file type.

Please set application file type in cf:

```
    M=MAIN      B=BACKUP      S=SECURE      N=NOTYPE
******************************************************************************
 NO.    Size(B)                Time    Type       Name
  0    15561860   Jul-10-2006 14:14      N    cf:/main.bin
******************************************************************************
Enter File Name:cf:/main.bin
```

Select the application program as the main boot file, and enter its complete path and file name.

```
      Modify this file Attribute:
           1.   +Main
           2.   -Main
           3.   +Backup
           4.   -Backup
           5.   Exit
      Enter your choice(1-5):1
```

Enter "**1**" to set the selected application program to be the main boot file, i.e. the default boot file of the system.

Step 6: Enter <5> to exit to the main BootROM menu. Enter <1> to boot from the CF card.

Caution:

- The file in the CF card will be overwritten if the file name being input is the same as the original file name in the CF card.
- Make sure the space on memory is sufficient. Or, the system prompts insufficient space:

```
Updating File main.bin
Insufficient CF Card space or failed device writing operation
```

- The file updated will directly replace the original file of this type to become the only application program. The main.bin file downloaded here will replace the original M file directly to become the main boot program.
- Refer to section 5.1.1 "Files" for detailed descriptions of file types.

5.6 Maintaining Application Program and Configuring Through Command Lines

After booting the router normally, you can upgrade and backup application program and backup and recover configurations under command line mode.

5.6.1 Maintaining the Router with TFTP Server

The TFTP service provided by the router is TFTP Client — the router serves as TFTP Client, and the file server serves as TFTP Server. You can input commands to upload the configuration file and application program of the router to the file server, or download configuration file or application program to the router from the file server.

I. Configuring environment

Step 1: Set up hardware environment (refer to section 5.5.2 "Upgrading Application Program Through Ethernet Interface" for details), and point the server path to the folder where the file is put.

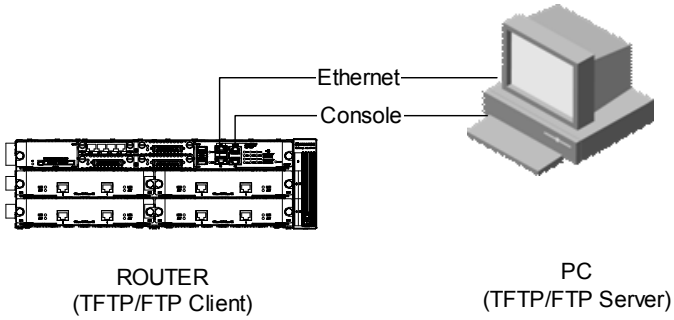

Figure 5-8 Networking diagram for maintenance under command line mode

Configure the IP addresses of the two sides to be in the same network. In this section, the TFTP server is set to 192.168.0.1, and the Ethernet interface connected to it (Ethernet interface 0/0 in this example; so, any interface is OK) is set to 192.168.0.2. Both can use the **ping** command to check if the connection is successful.

II. Backing up and recovering application program and configure file

After finishing environment building, perform the following operations:

View the files included in current file system with the **dir** command:

```
<H3C>dir
Directory of cf:/

   0   -rw-  14323376  Apr 03 2006 15:36:48   main.bin
   1   drw-         -  Mar 20 2006 09:55:28   logfile
   2   -rw-       909  Apr 04 2006 10:54:38   configbak.cfg
   3   -rw-      1045  Apr 04 2006 11:31:36   config.cfg
   4   -rw-  14323376  Mar 31 2006 17:50:22   backup.bin

63340 KB total (20928 KB free)

File system type of cf: FAT32

<H3C>
```

Use the command as follows to backup the config.cfg file on the router to TFTP server and save as config.bak:

```
<H3C>tftp 192.168.0.1 put config.cfg config.bak
  File will be transferred in binary mode
  Sending file to remote tftp server. Please wait... \
  TFTP:     1045 bytes sent in 0 second(s).
  File uploaded successfully.
```

Use this command to download the config.cfg file on the server to the router:

```
<H3C>tftp 192.168.0.1 get config.cfg config.cfg
```

```
The file config.cfg exists. Overwrite it?[Y/N]:y
  Verifying server file...
  Deleting the old file, please wait...
  File will be transferred in binary mode
  Downloading file from remote tftp server, please wait...\
  TFTP:     1045 bytes received in 0 second(s)
  File downloaded successfully.
```

If a config.cfg file already exists in the router, select <Y/y> to overwrite it.

⚠ **Caution:**

- If a config.cfg file already exists on the server, it will be overwritten.
- The above operations are performed under user view.
- The backup configuration file can be modified by text editor. The configuration file modified during download process can modify the configuration, and the modification takes effect after rebooting. Similarly, you can also download application program to the router to overwrite the old main program to upgrade the application program.

5.6.2 Maintaining the Router with FTP Server

I. Maintaining the router when it serves as the server

FTP (File Transfer Protocol) is an application layer protocol in the TCP/IP suite. It mainly transfers files among remote hosts. Carried over TCP, it provides reliable and connection-oriented data transfer service but does not provide access authorization and authentication mechanism.

The FTP service provided by the router is FTP Server, that is to say, the router serves as the FTP Server. You can run FTP Client to log onto the router and access files on the router.

Install FTP Client before using FTP. No FTP Server is available with the H3C MSR 50 series. You must install one yourself. Take the FTP Client with Windows XP for example.

Step 1: Build hardware maintenance environment as follows:

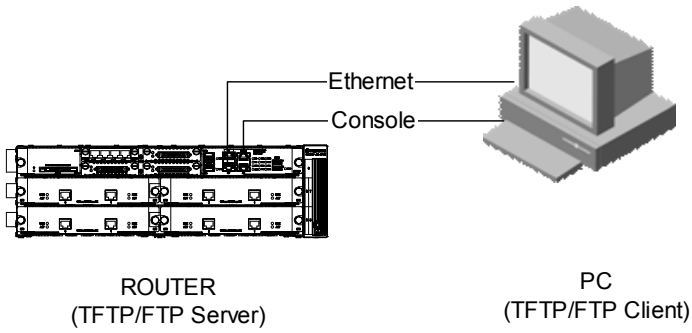

Figure 5-9 Router maintenance when it serves as the server

Configure the IP addresses of the two sides to be in the same network. In this section, the PC server is set to 192.168.0.1, and the router Ethernet interface connected to it (Ethernet interface 0/0 in this example; so, any interface is OK) is set to 192.168.0.2. Both can use the **ping** command to check if the connection is successful.

Step 2: Boot FTP service.

You can boot FTP service after configuring FTP server authentication and authorization. FTP server supports multiuser access. The remote FTP user sends request to the FTP server, which then executes accordingly and returns the result of the execution to user. Use the following command to boot the FTP service:

```
[H3C]ftp server enable
% Start FTP server
```

Add FTP authorized user name and password:

```
[H3C]local-user guest Set up the user guest
[H3C-luser- guest]service-type ftp The user type is FTP user
[H3C-luser- guest]password simple 123456   Add the password 123456 for the
user guest
```

Step 3: Maintain the router.

After booting FTP service of the router and configuring user name and password, you can boot FTP Client on your PC. Take the FTP Client with Windows XP for example:

Enter <ftp> in the [DOS] window, and the system prompts:

```
C:\Documents and Settings\Administrator>ftp
ftp>  The system prompts ftp>
ftp> open 192.168.0.2 Connected to the router IP
Connected to 192.168.0.2.
220 FTP service ready.
User (192.168.0.2:(none)): guest   Enter the user name configured on the
router
331 Password required for guest
Password: Enter the password 123456
230 User logged in.   Successfully connected to the server
```

Now, we can use the following command to perform maintenance of the router. In this example, the main.bin file on the router is backed up to the PC.

```
ftp> binary   Change the transfer mode to binary
200 Type set to I.
ftp> lcd c:\temp  Change local path
Local directory now C:\temp.
ftp> get main.bin main.bin Backup files to PC from the router
200 Port command okay.
150 Opening BINARY mode data connection for main.bin.
226 Transfer complete.
ftp: 14323376 bytes received in 16.81Seconds 851.87Kbytes/sec.
```

Recover the backup file to the router command:

```
ftp> put main.bin main.bin Recover the local file to the router
200 Port command okay.
150 Opening BINARY mode data connection for main.bin.
226 Transfer complete.
ftp: 14323376 bytes sent in 8.29Seconds 1727.37Kbytes/sec.
ftp> quit Quit the FTP
221 Server closing.
```

II. Maintaining the router when it serves as the client

You can also maintain the router file system by building FTP server and making the router serve as the client.

Step 1: Build maintenance environment as follows:

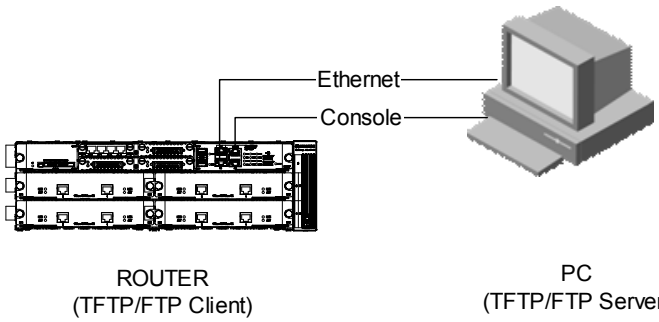

Figure 5-10 Router maintenance when it serves as the client

When the router serves as the client, you can run FTP server program on your PC as the FTP server, and set the server path. Then, add user name and password for the router.

Configure the IP addresses of the two sides to be in the same network. In this section, the FTP server is set to 192.168.0.1, and the Ethernet interface connected to it (Ethernet interface 0/0 in this example; so, any interface is OK) is set to 192.168.0.2. Both can use the **ping** command to check if the connection is successful.

Step 2: Maintain the router through the terminal connected to the console port as follow:

```
<H3C>ftp 192.168.0.1
Trying 192.168.0.1 ...
Press CTRL+K to abort
Connected to 192.168.0.1.
220 3Com 3CDaemon FTP Server Version 2.0
User(192.168.0.1:(none)):guest Enter the user name configured on the router
331 User name ok, need password
Password: Enter the corresponding password
230 User logged inConnect successfully

[ftp]
```

Use the command as follows to maintain the router.

Here, **get** and **put** commands are used to backup and recover files.

```
[ftp]get main.bin main.bin Download files to the router from the server
 cf:/main.bin has been existing. Overwrite it?[Y/N]:y   Overwrite it or not?
200 PORT command successful.
150 File status OK ; about to open data connection
226 Closing data connection; File transfer successful.
FTP: 14323376 byte(s) received in 69.256 second(s) 206.00K byte(s)/sec.
[ftp]put main.bin main.bin Backup the router files to the server
200 PORT command successful.
150 File status OK ; about to open data connection
226 Closing data connection; File transfer successful.
FTP: 14323376 byte(s) sent in 15.974 second(s) 896.00Kbyte(s)/sec.
[ftp]quit                                    Quit the FTP
221 Service closing control connection
```

5.7 Maintaining Application Program and Configuration File

You can modify and display the file type under the file control submenu:

Enter <4> under the main BootROM menu to enter the file control submenu. The system prompts:

```
========================<File CONTROL>=======================
|Note:the operating device is CF Card                       |
| <1> Display All File                                      |
| <2> Set Application File type                             |
| <3> Set Configuration File type                           |
| <4> Delete File                                           |
| <5> Exit To Main Menu                                     |
=============================================================
```

Enter your choice(1-5):

I. Display all files

Enter <1>, and the system prompts:

```
Display All File In cf:
*************************************************************************
 NO.    Size(B)                Time       Name
  0    14323376   Mar-23-2006 11:47    cf:/main.bin
  1    14144592   Mar-17-2006 19:39    cf:/d13.bin
  2         935   Mar-23-2006 15:39    cf:/config.cfg
  3         160   Mar-20-2006 09:55    cf:/private-data.txt
  4    14323456   Mar-25-2006 10:38    cf:/secure.bin
  5      238664   Mar-27-2006 10:50    cf:/logfile/logfile.log
*************************************************************************
```

II. Set application file type

Enter <2> under the file control submenu to enter the set application file type menu:

```
Please set  application file type in cf:

    M=MAIN      B=BACKUP      S=SECURE      N=NOTYPE
*************************************************************************
 NO.    Size(B)                Time   Type       Name
  0    14323376   Mar-23-2006 11:47       M cf:/main.bin
  1    14144592   Mar-17-2006 19:39       B cf:/d13.bin
  2    14323456   Mar-25-2006 10:38       S cf:/secure.bin
*************************************************************************
Enter File Name:
```

Enter the file name, including device type and extension name. Take cf:/main.bin for example. Enter the complete file name, press <ENTER>, and then the system prompts to modify the file type:

```
Enter File Name:cf:/main.bin


      Modify this file Attribute:
           1.   +Main
           2.   -Main
           3.   +Backup
           4.   -Backup
           5.   Exit
      Enter your choice(1-5):
```

You can set the file type to +M, -M, +B and -B by entering 1 to 4. Refer to section 5.1 Introduction for details.

III. Set configuration file type

Enter <3> under the file control submenu to enter the configuration file type menu.

```
 Please set  configuration file type in cf:

    M=MAIN         B=BACKUP         N=NOTYPE
**************************************************************************
 NO.    Size(B)                Time    Type       Name
  0    14323376   Mar-23-2006 11:47       M   cf:/router.cfg
  1    14144592   Mar-17-2006 19:39       B   cf:/a.cfg
  2    14323456   Mar-25-2006 10:38       N   cf:/b.cfg
**************************************************************************
Enter File Name:
```

Enter the file name, including device type and extension name. Take cf:/router.cfg for example. Enter the complete file name, press <ENTER>, and then the system prompts to modify the file type:

```
Enter File Name: cf:/router.cfg

      Modify this file Attribute:
           1.   +Main
           2.   -Main
           3.   +Backup
           4.   -Backup
           5.   Exit
      Enter your choice(1-5):
```

You can set the operation file to the types of M, Cancel M, B and Cancel B by entering 1-4. Refer to 5.1.1 “Files” for details.

IV. Delete files

Enter <4> under the file control submenu to delete files:

```
Delete All File In cf:
**************************************************************************
 NO.    Size(B)                Time       Name
  0    14323376   Mar-23-2006 11:47    cf:/main.bin
  1    14144592   Mar-17-2006 19:39    cf:/d13.bin
  2         935   Mar-23-2006 15:39    cf:/config.cfg
  3         160   Mar-20-2006 09:55    cf:/private-data.txt
  4    14323456   Mar-25-2006 10:38    cf:/secure.bin
  5      238664   Mar-27-2006 10:50    cf:/logfile/logfile.log
**************************************************************************
Enter File Name:
```

```
Enter the file name, press <ENTER>, and then the system prompts deleting
success:
deleting...
success!
```

Caution:

Confirm the file to be deleted before deleting since the system does not prompt you to confirm when deleting files.

V. Exit to the main menu

Exit to the main BootROM menu.

5.8 Dealing with Router Password Loss

Do as follows when your BootROM password, user password or Super Password is lost.

5.8.1 User Password Loss

You cannot enter the system if you lose your user password. You can boot the system by neglecting system configuration. Perform the following operations:

Step 1: Enter the main BootROM menu, and select <6> to boot by ignoring system configuration:

The system prompts:

```
........
Flag Set Successfully.
```

The system prompts set success.

Step 2: When the main BootROM menu appears again, enter <a> to reboot the system.

```
........
system start booting......Version  2.11
```

Step 3: Set new password under the system view after rebooting.

```
[H3C]user-interface console 0
[H3C-ui-console0]authentication-mode password
[H3C-ui-console0]set authentication password simple 123456
```

This indicates that the password authentication is adopted at the console port and the password is set to 123456 and stored in plain text.

Note:

- After reboot, the system runs with the initial default configuration. The original configuration files are stored in memory. To restore the original configurations, you can use the **display saved-configuration** command to display them, and then copy and execute them.
- When storing the password in plain text, you can use the **display current-configuration** command to see the password in the current configuration. If you use the **set authentication password cipher 123456** command when setting the password, the password is encrypted and stored.

Step 4: Save the new configuration.

```
[H3C] save
```

Note:

Execute the **save** command after modifying the user password to save the new password.

5.8.2 BootROM Password Loss

Contact the agent or our technical support personnel in the event of BootROM password loss. They can help you set a new password.

Modify the BootROM password under the main BootROM menu.

Enter <5> to modify the password following the prompt. The console terminal displays:

```
Change password.
Old password:                        Enter the old password
New password:                        Enter the new password
Verify:                              Enter the new password again
........Password Set Successfully.   The new password is set successfully
```

Note:

The password modification fails when old password is not correct or new password is not correctly entered, and then the system exits this operation.

5.8.3 Super Password Loss

The Super Password enables you to switch among the four Super levels. In the event of Super Password loss, you cannot perform the operations requiring higher right.

Enter <8> under the main BootROM menu to clear the Super Password.

Select this option, quit the menu and reboot the router. You can directly enter the system view. Only after the first rebooting will the setting take effect (the Super Password restores after the second rebooting).

5.9 Backing up and Restoring BootROM

Enter <7> under the main BootROM menu to enter the BootROM operation submenu. Refer to section 5.2.2 IV. "BootROM operation submenu" for details.

Enter <1> under the menu, and the system starts to backup the entire BootROM. The system prompts:

```
Backing BootRom....
Updating the backup Basic BootRom.......
Backing Basic BootRom Success!
Updating Back Extended BootRom.........
Backing Extend BootRom Success!
```

Now, the entire BootROM is backed up to the memory.

Enter <2> under the menu to restore the BootROM in the memory to the system:

```
Restore Basic BootRom
Updating the Norm Basic BootRom.............
Restore Basic Bootrom Success!
Restore Extend BootRom
Updating Extended BootRom.............
Restore Extend Bootrom Success!
```

Chapter 6 Slot Position of H3C MSR Series Routers

6.1 Slot Position of H3C MSR 20 Series Routers

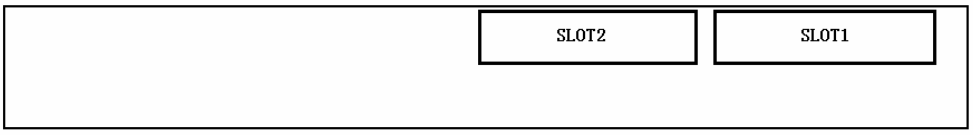

Figure 6-1 Slot position of the MSR 20-20

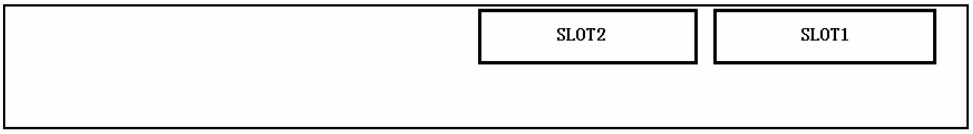

Figure 6-2 Slot position of the MSR 20-21

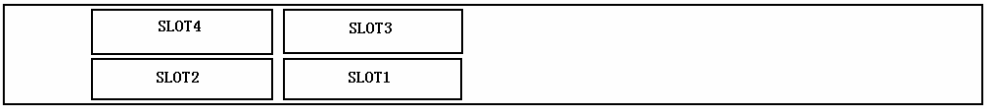

Figure 6-3 Slot position of the MSR 20-40

6.2 Slot Position of H3C MSR 30 Series Routers

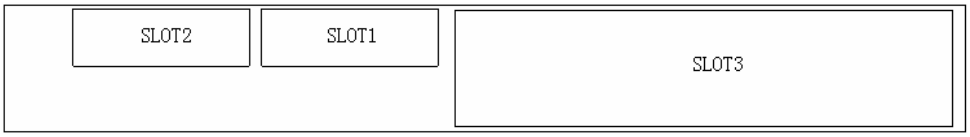

Figure 6-4 Slot position of the MSR 30-11

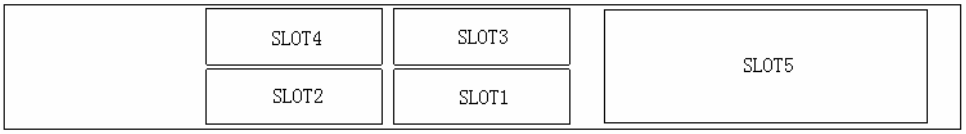

Figure 6-5 Slot position of the MSR 30-16

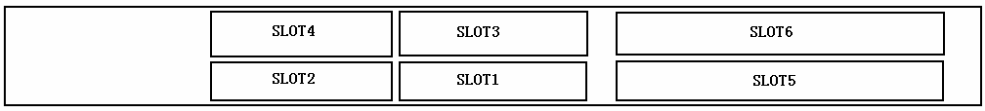

Figure 6-6 Slot position of the MSR 30-20

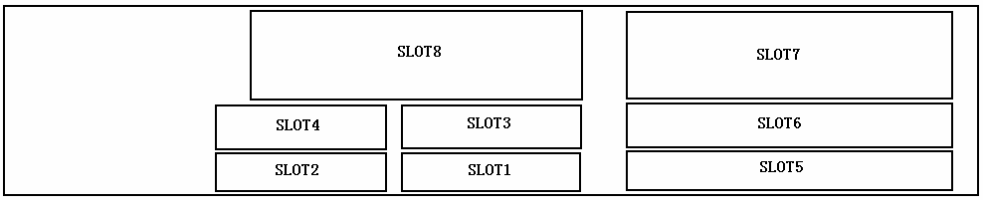

Figure 6-7 Slot position of the MSR 30-40

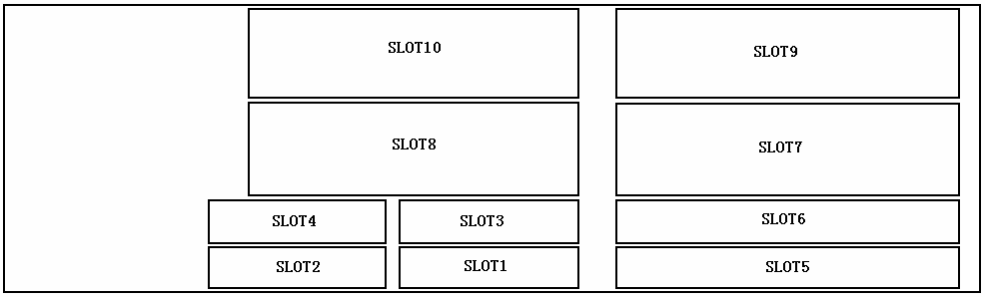

Figure 6-8 Slot position of the MSR 30-60

6.3 Slot Position of H3C MSR 50 Series Routers

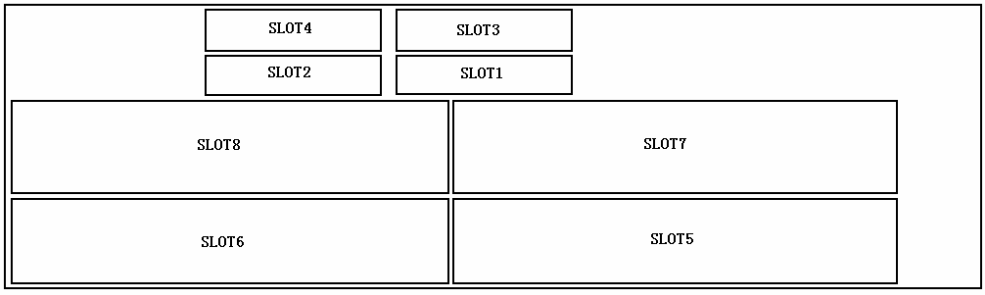

Figure 6-9 Slot position of the MSR 50-40

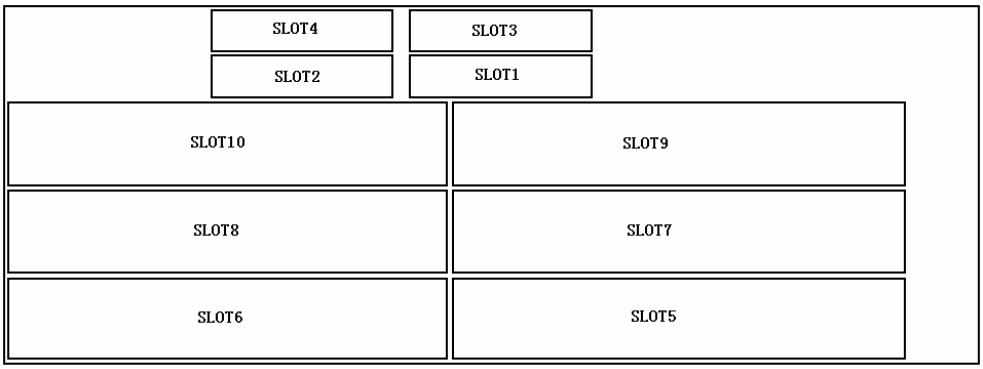

Figure 6-10 Slot position of the MSR 50-60